MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during October, 1885, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i.

The number of areas of low pressure charted during the month is eight, the average for October for the last twelve years being 10.7. That described as number iv was the severest storm of the month, and during its passage from near Key West, Florida, to the Gulf of Saint Lawrence, from the 10th to 15th, caused dangerous gales and very high tides at the coast stations.

The mean temperature was below the normal by from 1° to 7° in the districts east of the Rocky Mountains, except in northern New England, where it was slightly above the normal. In the Rocky Mountain districts and on the Pacific coast the month was warmer than the average, the departures from the normal temperature being nearly as marked as those for districts to the eastward, as mentioned above.

The precipitation was above the average in the lower Missouri valley and over the greater part of the country to the eastward of the Mississippi River; it was below the average in the upper lake region, east Gulf states, and, except at a few stations, in all districts west of the Mississippi.

The very heavy rains of the 28th and 29th, attending the passage of the area of low pressure described as number vii, caused destructive freshets in Virginia and West Virginia.

There were but few local storms and tornadoes during the month.

Under the heading "Temperature of the air" will be found a table showing the dates of the last frosts of spring and the first frosts of autumn for the years from 1875 to 1884, inclusive.

An additional chart (number v) is published with this REVIEW; it shows the ranges of extreme temperature over the United States since the establishment of Signal Service stations, *i. e.*, the difference between the highest and lowest observed temperature during the period of observations.

In the preparation of this REVIEW the following data, received up to November 20, 1885, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and seventeen Canadian stations, as telegraphed to this office; one hundred and seventy-seven monthly journals and one hundred and sixty-six monthly means from the former, and seventeen monthly means from the latter; two hundred and eighty monthly registers from voluntary observers; forty-five monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Georgia, Indiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

Referring to the use of the terms "cyclones," "areas of low pressure," "tornadoes," etc., the following brief definitions have been recommended for general use in this REVIEW:

It is advised that the terms "areas of high pressure" and "areas of low pressure" be used in publications describing the location of either feeble or decided minima or maxima of atmospheric pressure, but upon the occurrence of distinct cyclones, as defined below, the term "cyclone" should be used in descriptions.

A cyclone is a large, gyratory storm, generally from 500 to 1,000 miles, or more, in diameter, with a considerable area of low pressure in the interior.

A tornado consists of a very small and violent gyration of air, generally much less than a mile in diameter, with a rapidly ascending current in the centre, and a low atmospheric pressure very near the centre although there is generally too much violence of agitation for it to be observed, and it is specially marked by a characteristic funnel-shaped cloud with a progressive movement.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The mean atmospheric pressure for October, 1885, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The mean pressure is greatest over the central and northern Rocky Mountain districts, where the barometric means generally range between 30.1 and 30.14, the highest monthly mean, 30.14, being reported from Fort Benton, Montana. The mean pressure is least over Florida and the southern portions of Arizona and California, the barometric means ranging from 29.9 to 29.95, the lowest being 29.9, at Fort Thomas, Arizona. Eastward from the area of greatest mean pressure to the upper lake region the barometric means decrease to 29.94 (at Milwaukee, Wisconsin), and from the upper lake region eastward to New England and the Canadian Maritime Provinces the mean pressures increase to 30.07 at Yarmouth, Nova Scotia. From the south Atlantic coast to western Texas there is a gradual increase in the barometric means from 29.95 to 30.05. Along the Pacific coast the pressures increase with the latitude from 29.91 in southern California to 30.0 on the north Pacific coast.

As compared with the mean pressure for the preceding month, there has been a decrease, ranging from .01 to .08, in all districts to the eastward of the Mississippi River, with the exception of the east Gulf States, New England, and the Canadian Maritime Provinces, where there has been an increase. A decrease in the barometric means for October as compared with those for September, in the districts above named, is an abnormal feature, as the normal pressure for October averages about .05 above that for September. To the westward of the

Mississippi River the pressure in all districts is greater than for September, and over the greater part of this region the increase exceeds .10. The greatest excess is shown in the central and northern Rocky Mountain districts, where the difference between the means for the two months ranges from .15 to .23.

The departures from the normal pressure at various Signal Service stations are given in the tables of miscellaneous meteorological data, and on chart iv they are exhibited by lines connecting stations of equal departure. On the Pacific coast and to the eastward of the ninety-seventh meridian the mean pressure for October is below the normal, the departures exceeding .10 in the lower lake region, Ohio Valley, Tennessee, and in the middle and south Atlantic states; on the Pacific coast the departures below the normal vary from .01 to .05. In the plateau districts and over the eastern slope of the Rocky Mountains the pressure is above the normal, the departures ranging generally from .02 to .07.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the tables of miscellaneous data. They are greatest in the Middle States and least in the southern slope and southern plateau. In all districts to the westward of the Mississippi River, except in Dakota and Montana, the monthly ranges were less than .70. To the eastward of the Mississippi, except in the east Gulf states and Florida, the ranges exceeded .70. The greatest range, 1.23, occurred at Philadelphia, Pennsylvania, and the least, .26, at Fort Thomas, Arizona.

AREAS OF HIGH PRESSURE.

Five well-defined areas of high pressure passed over the United States and territories during the month of October. The first was observed in the northern Rocky Mountain regions west of the one hundred and seventh meridian, and extended westward to the north Pacific coast. The second passed southward to the west Gulf states and there disappeared. Two passed southeastward to the Ohio Valley and then northeastward, disappearing to the north of New England, and the fifth, at no time wholly within the stations of observatin, passed eastward north of the Lake region, and was central in the Saint Lawrence Valley at the close of the month.

The following summary shows where these areas were first and last observed, with the dates of observations:

I.—First observed in Washington Territory, on October 1st; last observed in Alabama, on the 5th.

II.—First observed in British Columbia, on the 4th; last observed north of New England, on the 9th.

III.—First observed north of Montana, on the 7th; last observed northeast of Nova Scotia, on the 14th.

IV.—First observed in Montana, on the 17th; last observed in Louisiana, on the 22d.

V.—First observed north of Minnesota, on the 26th; last observed in the Saint Lawrence Valley, on the 31st.

The following is a detailed account of the weather conditions attending the development and movement of these areas dur their transit over the United States:

I.—On the morning of the 1st an area of high pressure extended over the Rocky Mountain region, the pressure being greatest in the eastern portion of Washington Territory, where it was from .2 to .3 above the normal; it was also above the normal from the Saint Lawrence Valley westward to Washington Territory, and from .2 to .3 below the normal in the Southern States, where general rains occurred. This area moved eastward over Montana during the 2d and 3d, causing a decided fall in temperature, with light snow in Colorado, and the first killing frost at Bismarck, Dakota, on the morning of the 3d. A low area to the east increased in energy, moving southeastward to the Lake region, while the pressure increased rapidly on the east slope of the Rocky Mountains and as far south as Texas; this rapid increase of pressure was attended by high winds in the Missouri Valley and southward to the Gulf coast, and general frosts in the Mississippi Valley as far south as the thirty-fifth parallel; these conditions also extended to the Rocky Mountain regions. During the 3d this area passed rapidly from the upper Missouri valley to Texas, where it was central on the morning of the 4th, after which the direction of movement changed to eastward, and it was last observed in the east Gulf states. On the morning of the 5th light frosts were reported in Alabama, Georgia, Tennessee, North Carolina, and Virginia.

II.—On the morning of the 4th a second area of high pressure appeared north of Washington Territory while the preceding area was central in the Southwest. The barometer continued above, or near, the normal at stations in the Rocky Mountain regions, while it was from .2 to .5 below the normal on the Atlantic coast and in the Saint Lawrence Valley, where a low area was central, attended by gentle winds in the Northern States and brisk to high westerly winds in the Lake region and on the middle Atlantic coast. This area moved to the southeastward as it increased in extent, but its centre followed the Missouri River and passed to the eastward; it followed the course of the Ohio Valley during the 5th, 6th, and 7th, causing frosts in the Northern States and as far south as Tennessee. These frosts proved injurious to vegetation in the Ohio Valley, but their occurrence had been previously announced by "frost warnings"; the first killing frost of the season also occurred at Boston, Massachusetts, on the morning of the 7th. When this high area was central over Virginia, a well-defined low area extended over southern Nova Scotia, which had caused heavy rains on the New England coast during the 6th; after reaching the Atlantic coast this high area moved to the northeastward over the middle Atlantic states, New England, and Nova Scotia, and disappeared to the north of the Gulf of Saint Lawrence on the 9th, the pressure increasing at the centre during the northeasterly movement, and when it was last observed the pressure had attained its maximum.

III.—This area appeared north of Montana on the morning of the 7th, but previous reports indicate that it developed west of the Rocky Mountains, and there were indications of a high area over the northern plateau regions on the afternoon of the 6th. This area, after passing to the eastward of the Rocky Mountains, moved southward over the Missouri Valley during the 8th, and after the centre had reached the latitude of Omaha, Nebraska, passed eastward over the Lake region and the middle Atlantic states during the 9th and 10th, attended by generally fair weather; it was central in Virginia on the morning of the 10th, when it had included within its limits a greater portion of the United States east of the Mississippi, and extended from the Saint Lawrence river to the Rio Grande Valley; during the 10th it moved northward to the Saint Lawrence Valley, with a cyclone advancing northward from southern Florida. The distribution of pressure on the morning of the 11th was as follows: A well-defined area of high pressure central near Montreal, Province of Quebec; the cyclone advancing northward, central in northern Florida; areas of low pressure central north of Minnesota, with the barometer .4 below the normal; low area central north of Nova Scotia, where the barometer was .3 below the normal; a second area of high barometer extended over the northern plateau region. After reaching the Saint Lawrence Valley, this area moved slowly eastward during the 12th and 13th, and disappeared over the north Atlantic on the 14th. It moved less rapidly than the cyclone which was to the southwest of it, and as the pressure increased within the high area the barometric gradients in the southwest quadrant were also increased, the difference of pressure being .9 between stations in the lower lake region and those to the northeast of New England.

IV.—As in the preceding area, this was first observed over the northern plateau region, but the pressure increased as it moved eastward to the Rocky Mountains, and it was central in Montana on the morning of the 17th; it extended over the upper Missouri valley, causing sleet and snow at the central Rocky Mountain stations, and cold northerly winds and rain at the southern Rocky Mountain stations on the morning of

the 18th. An area of low pressure developed in the Indian Territory during the 18th, while the barometer continued high in the extreme northwest; there was a slight advance to the northeastward during the 18th and 19th as the storm-centre, previously referred to, moved rapidly northward over the upper lake region, causing general rains in the Mississippi and Ohio Valleys and the Lake region; when the low area was central north of Lake Huron there was a rapid increase of pressure on the eastern slope of the Rocky Mountains and the centre of high area was transferred from northern Montana on the 20th to eastern Texas on the 21st; killing frosts were reported on the latter date at Cairo, Illinois, Fort Gibson and Fort Sill, Indian Territory. This area extended over the Southern States during the 21st, causing light frosts as far south as Pensacola, Florida, Augusta, Georgia, and Smithville, North Carolina, and killing frosts from Virginia to Arkansas on the morning of the 22d; this area disappeared during the 22d, by the gradual decrease of pressure.

V.—On the morning of the 26th the barometer was high in the region north of Minnesota and Dakota, the pressure having increased rapidly during the previous night, the area of low pressure having moved from Manitoba eastward to Lake Superior during the 25th; the pressure increased during the 26th at the northern Rocky Mountain stations, and on the 27th the centre of greatest pressure was north of Montana, there having been an apparent movement to the westward during the preceding twenty-four hours, and at the same time a low area had developed in Colorado. The high and low areas thus described moved slightly to the south of east over nearly parallel lines during the 27th, the former being central near Bismarck, Dakota, and the latter central near Saint Louis, Missouri, on the morning of the 28th; following this report, there was an apparent movement to the northward during the 28th, while the low area continued in a southeasterly course; as this movement carried the high area beyond the limits of the stations of observation its movement to the eastward can only be approximately determined, but as the storm-centre previously referred to moved southeastward on the Atlantic coast during the 30th, it apparently drew the high area to the southeastward. At the close of the month it was central in the Saint Lawrence Valley near Quebec, Province of Quebec, separating the storm which had disappeared over the north Atlantic and the low area which was forming in the Mississippi Valley. At the close of the month a sixth area of high pressure extended over the central and northern Rocky Mountain regions, having advanced to this position from the north Pacific coast, where it was first observed on the morning of the 30th.

AREAS OF LOW PRESSURE.

Eight areas of low pressure have been traced from the tridaily charts for October; five were first observed on the eastern slope of the Rocky Mountains; one was a well-defined tropical storm which passed northward along the Atlantic coast and Florida; one probably originated on the north Pacific coast and passed eastward north of Lake Superior. These areas of low pressure all passed northeast as they approached the Atlantic coast, and the direction of movement was either directly east or inclined toward the southeast when their centres were to the eastward of the Mississippi Valley. Several slight areas of low pressure occurred within the limits of the stations of observation which have not been traced on the chart, although they are referred to in the text.

I.—On the afternoon of the 1st this area was north of Montana, with high areas to the southwest and to the eastward. General rains prevailed in the Southern States, and there were indications of a tropical storm passing northeastward east of the south Atlantic states; the general course of movement of this area was to the southeastward during the 1st and 2d, but as it was north of the stations of observation its centre could only be approximately located. On the morning of the 3d it was central near Lake Huron, attended by general rains in all districts east of the Mississippi; a cold wave was advancing from the westward, which caused an increase of gradients in the west quadrant, and a high area to the eastward was passing over the north Atlantic. At the morning report of the 3d this depression changed its direction of movement to the northeast and followed the general course of the Saint Lawrence Valley during the 4th, followed by brisk and high westerly winds in the lower lake region and light snows in the northern portion of the upper lake region; after passing to the lower Saint Lawrence Valley it increased in energy, and on the 5th, when last observed, the barometer was below 29.30 near the centre of the disturbance, and severe westerly gales were reported in the Maritime Provinces; these gales continued until the 6th over the Gulf of Saint Lawrence, but the pressure was increasing and the storm soon passed to the northeastward.

II.—On the afternoon of the 6th this area of low pressure developed in the central Rocky Mountain region, while a high area covered the Mississippi and Ohio Valleys and a second high area was advancing from the northern plateau region; these conditions continued, with a slight easterly movement, until the morning of the 7th, when the low area was central in Iowa, the barometer being highest in the middle Atlantic states and Montana. During the succeeding twenty-four hours the movement was directly eastward, but the advance of the high area from the westward caused this area to disappear in the lower lake region before it reached the Atlantic coast. This depression caused no remarkable disturbance during its passage over the Lake region, and was only attended by light local showers, but its disappearance within the limits of the stations of observation makes this depression of special interest. At the time of the disappearance of this low area, the high area to the northeastward of New England was increasing and that to the westward was extending over the Saint Lawrence Valley; a low area of considerable energy was central north of Montana, and the succeeding reports show that the cyclone of the 7th was at that time central south of Florida.

III.—This area probably advanced from the north Pacific coast north of Washington Territory; it moved slowly eastward parallel with the northern portion of the United States during the 9th and 10th, and was a well-defined storm-centre. The isobars inclosing this storm extended southward after passing the Rocky Mountain regions, and the advance of the cold wave from the westward apparently forced the principal portion of this area to the northward, north of Manitoba, while feeble secondary depressions were formed in the barometric trough which extended south into Texas. The track of number iii therefore ended near Fort Garry, Manitoba, where on the morning of the 11th the barometer was below 29.60, and the wind was southeast, twenty-eight miles, while at neighboring stations to the westward it was from thirty to thirty-five miles per hour from the north. The afternoon report of the 11th showed a rapid increase of pressure at Fort Garry, Manitoba, and a northwesterly wind of twenty-five miles per hour. These reports show that the principal depression either moved to the northeastward or was replaced by the high area which at that time extended over the Rocky Mountain regions.

IV.—This, the most severe storm of the month, had its origin in the tropics, and when first observed was central southwest of Florida on the morning of the 10th, although the reports from that region indicate that it had its origin to the south or southeast of Cuba; it moved slowly northward over Florida and was well defined as a cyclone on the morning of the 11th. Northeasterly gales and heavy rains were reported on the Florida and Georgia coasts, with the barometer below 29.60. At this report, stations on the Atlantic coast were informed that a cyclonic disturbance was central in Florida and that the storm would probably cause dangerous gales off Cape Hatteras and Cape Henry, which would make it unsafe for vessels to sail south from northern ports. The storm continued its northerly course during the 11th and 12th, the centre passing west of Jacksonville, Florida, and Savannah, Georgia, and continuing near the eighty-second meridian until midnight of the 12th, when it was central in southwest Virginia, with danger-

ous northeast gales south of New York. On the morning of the 12th, when the storm was still central in South Carolina, stations on the Atlantic coast were again warned of the approach of this severe storm, and the observers at all stations were directed to inform those interested in shipping that it was not safe for vessels to leave port. At midnight of the 12th secondary areas were formed in the upper Mississippi and Ohio Valleys, accompanied by general rains, and by an extension of the low area to the northwest, the storm-centre was transferred to the Ohio Valley on the morning of the 13th; there were steep barometric gradients on the middle Atlantic and New England coasts, the storm-centre being bounded by the isobar for 29.6, which included the entire Ohio Valley and the southern portion of the Lake region. After this deviation of the course to the northwest, the storm passed to the northeastward over the lower lake region and the Saint Lawrence Valley, attended by severe gales in the Lake region and on the Atlantic coast and in the Maritime Provinces. Cautionary signals were displayed from twenty-four to forty-eight hours in advance of this storm, and the observer at New York reports, relative to the severity of the storm, as follows:

Cautionary signals were hoisted at 7.45 p. m., October 11th; the public was notified of the approach of the cyclone by the publication in the morning papers of October 12th of the telegram of October 11th; a special bulletin was issued at 10 a. m., October 12th, in which was incorporated telegram received that morning from office Chief Signal Officer—this bulletin was in the Maritime Exchange, and the public notified by "ticker," and the various steamship companies by telephone from this office. The storm struck here about daylight of October 13th, and is reported to have been very severe on the New Jersey coast, and the most severe gale known on the Sound for twelve years. No disasters have been reported in this vicinity, which is certainly due to the warnings given by the service. On the 13th, the day of the storm, no vessels entered or left this port, it being the first instance of the kind known for twenty-five years.

The following notes by the Signal Service observers refer to this storm:

Cedar Keys, Florida: the barometer fell rapidly during the 10th, with brisk northeasterly winds and light rain, which continued during the 11th; at 12.30 p. m. on the 11th the wind veered to southeast and increased in force, reaching a maximum velocity of forty-eight miles per hour at 4.30 p. m., with barometer at 29.19; at 5.30 p. m. the barometer had risen to 29.24 and the wind had decreased to twenty-four miles, but threatening weather continued during the remainder of the day; the high winds caused the tide to rise to an unusual height; the highest wharves were submerged and many of the principal streets flooded.

Sanford, Florida: the barometer fell throughout the 10th, accompanied by heavy rain and brisk to high northeasterly winds; the rainfall for seventeen hours was 6.09 inches, the heaviest recorded since the establishment of this station; the highest wind-velocity, thirty miles per hour, occurred at 4.30 p. m.; at 9 p. m. the heavy rain ended and light rain continued until 10.05 p. m.; during the morning of the 11th the wind veered to south, and the barometer continued to fall until 3 p. m., when it read 29.50; light rains fell between 10 and 11 a. m. and 4 and 8 p. m. of the 11th.

Jacksonville, Florida: the wind blew in strong gusts from the northeast during the 10th, and at 10.50 p. m. increased to the force of a gale, which continued, at intervals, until 2.45 a. m. of the 11th; at 7 a. m. of the 11th the wind had backed to north and had decreased to four miles per hour; at 11 a. m. it had veered to east and began to increase in force; later the wind veered to south and southwest, increasing to a gale, which continued until 5.30 a. m. of the 12th. The barometer was lowest, 29.42, at 10 p. m. of the 11th, and the highest wind-velocities were thirty-six miles, northeast, at 1.55 a. m. of the 11th, and thirty-six miles, south, at 11.15 p. m. on the same date.

Savannah, Georgia: heavy rain and high northeasterly winds prevailed throughout the 11th. During the morning the barometer fell slowly, but in the afternoon and during the night it fell rapidly, the lowest reading, 29.49, occurring at 1 a. m. of the 12th, afterwards remaining stationary until 7 a. m. At the time of the lowest barometric reading the wind shifted to south and decreased in force from thirty-two to fifteen miles per hour. The high easterly and northeasterly winds caused the tide to rise to an unusual height, overflowing the adjacent rice fields. The Savannah River rose rapidly from 11 a. m. to 1 p. m., reaching a height eighteen inches above the highest point attained since the flood of August, 1881. Great damage was done to the railroads in this part of the state. No damage to shipping interests have been reported. The warning of the storm's approach was given eleven hours in advance, and enabled those interested to prepare for it.

Smithville, North Carolina: high southeasterly winds began at midnight of the 11–12th and continued, at intervals, until 1 p. m. of the 12th; a maximum velocity of forty-four miles occurred at 7.30 a. m. The timely warning of this storm given by the signal display occasioned much favorable comment.

Fort Macon, North Carolina: a southeasterly gale began at 7.10 p. m. on the 11th and continued until 6.30 a. m. of the 12th, the wind reaching a maximum velocity of fifty-six miles per hour.

Kitty Hawk, North Carolina: a gale began at 3 p. m. of the 12th and continued until about midnight of the 12–13th; a maximum velocity of fifty-three miles, southeast, occurred at 6.20 p. m. of the 12th.

Cape Henry, Virginia, 12th: a severe storm, from northeast to east, began during the early morning and continued until 2 a. m. on the 13th; the maximum velocity of the wind was forty-eight miles; the lowest reading of the barometer was 29.65.

Norfolk, Virginia: high northeasterly winds prevailed from noon of the 12th until past midnight. Considerable damage was done to unfinished buildings and other property in this vicinity. The signal ordered for this storm was heeded by all outward-bound vessels, and the display was favorably commented upon by the press of this city.

Cape Henlopen, Delaware: the storm which prevailed on the 12th and during the night of the 12–13th is said to have been as severe as the great storm of October, 1877. The timely warning given by the Signal Service of the approach of this storm was of the greatest value to shipping interests.

Barnegat City, New Jersey: a maximum wind-velocity of forty-eight miles, from the southeast, occurred at 9 a. m. the 13th.

Sandy Hook, New Jersey, 13th: an easterly gale, blowing steadily at the rate of from fifty to sixty miles per hour, with heavy rain, prevailed from 6 a. m. to 3.10 p, m.

Oswego, New York: the storm of the 13th began at 2.50 a. m. and continued until 8.10 p. m., the wind reaching a maximum velocity of forty-two miles, southeast, at 9.45 a. m. The storm caused considerable damage in this vicinity.

New Haven, Connecticut: high northeasterly winds prevailed during the 13th, which caused the tides to rise to an unusual height. The schooner "Minnehaha" was partly dismantled off Faulkner's Island.

V.—This storm developed in the Southwest immediately south of an area of high barometer which extended throughout the northern and central Rocky Mountain regions; general rains prevailed in the west Gulf states, and snow or sleet occurred in Nebraska, Kansas, and Colorado on the morning of the 18th, the centre of least pressure being south of Texas. Although an area of low pressure covered the Southwest, there was no movement until after midnight of the 18th, when the storm centre was located in the northwestern portion of Arkansas. The rapid flow of cold air from the northwest of this area forced this depression to the northeastward, and it passed over the central Mississippi valley and the upper lake region during the 19th, attended by general rains in the central valleys and in the Lake region. The pressure at the centre diminished as it approached the Lake region, where it attained its minimum on the afternoon of the 19th. This storm increased in energy as it moved northward until it passed beyond the limits of the upper lake region when it was followed by strong westerly winds and clearing, colder weather, the temperature falling below freezing in the northern part of the Lake region. This storm did not move down the Saint Lawrence Valley but apparently continued its northerly course over Hudson Bay.

VI.—Immediately after the disappearance of the storm traced as number v a feeble depression formed on the Atlantic coast south of New York, the centre being near Charlotte, North Carolina, at midnight of the 20th, attended by light, variable winds. The isobar bounding this depression was 30.0, the depression being of an elliptical form, extending from northern Virginia to southern Florida; this storm increased rapidly in energy and moved northeastward along the middle Atlantic coast during the 21st, the barometer falling rapidly at the centre, and the isobars bounding the centre retaining an elliptical form, with the longer axis extending north and south. The barometer attained its minimum when the centre reached Father Point, Province of Quebec, on the morning of the 22d. Moderate gales occurred at the Atlantic coast stations north of Cape Hatteras, and the heavy rains which marked the origin of this storm followed the storm-centre as it passed along the middle Atlantic coast and over the interior of New England.

VII and VII *a*.—On the 27th a barometric trough extended from central Rocky Mountain stations to the lower lake region, with indications that a storm was developing in the western portion of Nebraska. Previous to this report a slight depression had moved southeastward from the extreme northwest over the upper lake region, and at the midnight report of the 26th the barometer was low in southern Michigan, the isobar of 30.0, inclosing this depression, extending from Lake Ontario to Missouri. When this depression was marked in central and west Nebraska there were indications of a storm in the Gulf, south of Louisiana, and a high area was north in Montana. The following reports during the 27th and 28th indicate a general southeast movement of the high and low areas, while the area of low pressure in the Gulf moved slowly to the northeastward and united with this depression in western North Carolina on the morning of the 29th. Very heavy rains fell on the 28th and 29th in eastern Tennessee, the middle, and south Atlantic states, and destructive freshets occurred in Virginia and West Virginia. After the union of these low areas the course of movement was to the northeast on the Atlantic coast, the barometer falling rapidly at the centre as the storm moved northeasterly with increasing energy; severe gales occurred from Smithville, North Carolina, northward to Nova Scotia, but the storm apparently reached its maximum energy while the centre was passing over the New Jersey coast, the barometer falling below 29.20 along the track of the centre.

The following letter, from the secretary of the Maritime Exchange in New York City, is published as an evidence of the value of the storm warnings issued by the Signal Service:

THE MARITIME ASSOCIATION OF THE PORT OF NEW YORK,
PRODUCE EXCHANGE BUILDING, BEAVER STREET,
New York, November 10, 1885.

Gen. W. B. HAZEN, U. S. Army,
Chief Signal Officer, Washington, D. C.

DEAR SIR: Highly appreciating, as we do, the invaluable service you are rendering the commerce of the country by advanced reports of approaching storms, may we venture, now that the stormy season is upon us, to suggest that these reports be telegraphed to us at the earliest possible moment.

Thanking you for the promptitude with which they have hitherto been sent us, we merely suggest that any improvement in that direction, if any be possible, will further add to their usefulness.

Instantly upon their receipt, if in time, we conspicuously bulletin the message at the Maritime Exchange, and notify the steamers about leaving port. As an illustration of their usefulness, I would say that Captain Garvin, of the steamer "Orinoco," which cleared for Bermuda on the 29th ultimo, on receiving from us the advanced report you kindly sent us on that day, came to anchor in the harbor, together with a number of other outward-bound vessels. He is enthusiastic in praise of the service rendered, and to-day informed me that the report referred to probably saved a large amount, especially in the cost of cattle being shipped abroad, which would probably have suffered heavy loss had the vessels encountered the storm of which you gave warning.

Very respectfully, yours,
(Signed) F. W. HOUGHTON, *Superintendent.*

Severe gales also occurred in the lower lake region and brisk to high winds were reported in the upper lake region, but signals were not displayed west of Lake Huron. This storm moved rapidly along the New England coast during the 30th, the centre passing between Eastport, Maine, and Yarmouth, Nova Scotia, and then northeastward north of Sydney, Cape Breton, causing severe gales on the 31st at the most northeasterly stations, but the pressure near the centre of the storm was apparently increasing after it left the limits of the United States.

The following notes are from the reports of Signal Service observers:

Fort Macon, North Carolina: a southeasterly gale began at 9.25 p. m. on the 28th and continued until 5.05 a. m. of the 29th; at 1.35 p. m. the wind had shifted to high southwesterly and continued until 6.50 a. m. of the 30th; maximum velocities of forty-four miles, northeast, and forty-five miles, southwest, occurred during the storm.

Kitty Hawk, North Carolina: the barometer fell rapidly during the night of the 28–29th, with southeasterly winds and heavy rain; the wind attained the force of a gale at 1.45 a. m., and at 6 a. m. it reached a maximum velocity of seventy-six miles per hour. The barometer fell until 1 p. m., when the lowest reading, 29.19, was observed. The storm was apparently most severe between this place and a point nine miles northward. Within a distance of three miles sixty-five telegraph poles were broken off close to the ground, and a large number of trees were uprooted. The wind-velocity during this storm was the highest recorded since April, 1881, when the same velocity was attained. Considering the severity of this storm, the damage was very small. The storm-signal was displayed twelve hours in advance.

Barnegat City, New Jersey, 29th: high winds began at 9.45 a. m. and ended at 10 p. m.; a maximum velocity of fifty miles, northeast, occurred at 5.45 p. m.

Sandy Hook, New Jersey: a strong easterly gale, with light to heavy rains, prevailed on the 29th. The schooner "Charles H. Valentine" went ashore off the point of the Hook during the storm. This storm was marked by an unusual barometric range; at 11 p. m. of the 28th the barometer read 30.02, and at the same hour on the 29th it read 29.18—a range of .84.

Sandusky, Ohio: a gale began at 4.20 a. m. on the 29th and continued until 11.45 a. m. on the 30th; a maximum wind-velocity of fifty-three miles, north, occurred at 7.15 p. m. on the 29th.

Oswego, New York: the storm began at 6.55 p. m. on the 29th and continued until 4.50 p. m. of the 30th, the wind reaching a velocity of thirty-six miles, north, at 5.21 a. m.; this storm caused considerable damage to shipping interests.

VIII.—This storm developed in southeastern Colorado, within the southern limit of a barometric trough which extended northward to the British possessions, where a storm of considerable energy was central on the afternoon of the 30th; this storm, however, did not pass within the limits of the stations of observation, but the low area, number viii, moved slowly to the eastward with slight energy, attended by light rains in the central valleys, and at the midnight report of the 31st it had reached central Illinois, bounded by the isobars for 29.80 and 29.90, and the isobar for 30.00 forming the barometric trough which extended from Lake Superior to the west Gulf coast. At this report high areas extended over New England and the middle Atlantic states, and over the northern and central Rocky Mountain regions.

The following table gives the latitude and longitude in which the centre of each low area was first and last observed, with the average hourly velocity of each:

Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	53 00	103 00	51 00	65 00	34.0
II	44 00	99 00	42 00	82 00	24.0
III	52 00	112 00	51 00	96 00	18.0
IV	24 00	83 00	48 00	67 00	19.5
V	36 00	94 00	49 00	81 00	21.0
VI	35 00	81 00	50 00	67 00	30.0
VII	41 00	102 00	47 00	61 00	26.0
VII *a*	28 00	90 00	36 00	82 00	20.0
VIII	38 00	101 00	41 00	90 00	22.0
Mean hourly velocity					26.8

NORTH ATLANTIC STORMS DURING OCTOBER, 1885.

[*Pressure expressed in inches and millimetres; wind-force by scale of* 0-10.]

The tracks of the areas of low pressure that have appeared over the north Atlantic Ocean are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and reports collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to November 21, 1885.

The distribution of pressure over the north Atlantic Ocean during October, 1885, appears to have been somewhat complicated. During the first decade of the month an area of high pressure occupied the region between W. 52° and W. 30°, and from N. 52° southward to N. 32°, while over the region east of the thirtieth meridian the pressure was constantly low. Especially was this the case in the vicinity of the British Isles, where, on the 1st and 2d, the barometer fell to 29.15 (740.4) in the northern districts, and again on the 10th, when a cyclone of great intensity (not charted) appeared suddenly over the English Channel. In the last mentioned the barometer fell to 28.9 (734.0) and gales of hurricane force, from w. and nw., occurred over the ocean from W. 25° eastward over the Bay of Biscay to the French coast. During the period above mentioned the barometric pressure over the western part of the ocean likewise fluctuated greatly, areas of high, or low, pressures occupying Newfoundland, the Maritime Provinces, and the south Atlantic coast region alternately. Towards the end of the first decade and the commencement of the second severe gales prevailed over the western part of the ocean, caused by the passage of the cyclone described as number iv under "Areas of low pressure," and also during that of the storm described below as number 6; the latter being probably identical with that which caused great loss of life and property along the Labrador coast on the 10th and 11th.

During the second decade of October, 1885, the high area over mid-ocean began to give way, while the pressure over the eastern part of the Atlantic and the British Isles increased; in the western part no marked changes occurred until near the end of the period, when an area of high pressures spread southward and westward from about W. 55° to the American coasts. On the 16th the pressure over mid-ocean and north of the fortieth parallel began to increase and the region of low pressures was apparently transferred to that part of the ocean lying south of the above-mentioned parallel, and in the vicinity of the Azores; the data at hand, however, are insufficient to determine the paths of the areas of low pressure that may have appeared in that neighborhood. During the last decade of the month areas of low pressure again predominated in the British Isles and over the ocean east of 25° W.; over mid-ocean the pressure remained high, except during the last five days of the period when it gave way in advance of the low areas numbered 12 and 14. In the western districts it remained moderately high until the 28th, when a decided decrease set in, caused by the passage northeastward of the cyclonic storm described as number vii under "Areas of low pressure."

Mr. J. Antonio Estopina, chief officer of the Spanish s. s. "Valencia," reports as follows: "The weather during the present month (October, 1885) at the ports of Vigo and Santander, Spain, has been very unsettled. Frequent and abundant rains, with winds from the fourth quadrant, accompanied by frequent strong squalls of wind, rain, and hail, have prevailed."

Captain George Mitchell, commanding the British s. s. "Trinacria," lying in the port of Denia, Spain, also reported: "On the 13th, 14th, and 15th very unsettled weather with strong ne. gales and heavy rain; tops of the hills covered with snow, which is something unusual in Spain at this time of the year; there must have been very bad weather north."

The following are brief descriptions of the low areas charted:

1.—This was probably a continuation of the low area traced as number vii on the chart for September, 1885; at the midnight report of September 30th the storm-centre had passed off the Florida coast, and on the morning of October 1st it was apparently southeast of Charleston, South Carolina, the wind increasing to hurricane force at sea towards the evening of that day. The s. s. "Lone Star," Geo. W. Mason, commanding, reported a n. to ne. hurricane of force 10 (12, Beaufort scale); the lowest barometric reading, 29.64 (752.8), was at 7 p. m., in N. 32° 17′, W. 77° 45′. Captain Mason reports: "Hove-to on the starboard tack, and at 10 p. m. the wind had moderated to a fresh gale, although a heavy cross-sea was still running." The s. s. "Finsbury," S. E. Greystone, commanding, had light, variable winds, with heavy ne. sea-swell during the afternoon of the 1st; barometer at noon, 29.75 (755.6), in N. 26° 42′, W. 79° 45′. On the 2d the storm-centre was in the neighborhood of Cape Hatteras and moderate to strong e. gales prevailed at Hatteras and other coast stations, and also at sea. The s. s. "Claribel," T. M. McKnight, commanding, reported a fresh to strong gale from the e., suddenly shifting to s. at about 9 a. m. of the 2d, in N. 35° 20′, W. 73° 40′. During the 3d strong south and southwesterly winds prevailed near the coasts of the United States, and this low area probably united with that charted as number i, which on the 3d occupied the Lake region.

2.—During the 1st and 2d the observations indicated the presence of a slight depression over the region between N. 35° and 40° and W. 60° and 65°, and the report of Captain Mehegan, commanding the s. s. "Joseph Ferens," shows that a gale prevailed in connection therewith. The "Joseph Ferrens," in N. 37° 50′, W. 60° 39′, had a gale from s. to sw. and w. during the 1st and 2d; the lowest barometer, 29.71 (754.6), being observed at midnight of the 1st, in the above position. By the 3d this depression had apparently filled in.

3.—This area of low pressure appeared to the northwest of the British Isles on the 1st, and was attended by moderate to strong gales from w. and sw. over the ocean from about W. 20° eastward to the British coasts, and southward to the Bay of Biscay. On the 2d the centre of low pressure was to the northward of Scotland, with pressure about 29.1 (739.1), the w. and sw. gales continuing until the 3d.

4.—This low area apparently approached the British coasts from the northwest during the 4th, and passed eastward north of Scotland on the following day. The lowest pressure reported at sea was 29.22 (742.2) on the 4th, in about N. 56°, W. 16°, where a w. gale of force 8–9 prevailed.

5.—This area of low pressure appeared near the coast of Nova Scotia on the 7th; the pressure near the storm-centre was about 29.5 (749.3), and moderate westerly gales were reported near N. 41°, W. 67°, while strong southeasterly winds prevailed over the region between N. 40° and 45° and W. 50° and 60°. By the 8th it had disappeared from the chart.

6.—This was a cyclone which appeared on the 9th and which subsequently developed great energy during its passage northnortheastward. Its presence was clearly indicated on the morning of the 9th by the directions of the winds over the region between N. 35° and 43° and from W. 60° to 70°; the pressure over the region mentioned ranged from 29.7 (754.4) to 30.0 (762.0) on the morning of the 9th, but a decrease set in during the day; north of 40° N., and between W. 60° and 65°, the winds were from e. and ne., blowing with the force of a gale; to the eastward of W. 60° they were s. and se., strong breeze to moderate gale; north of Bermuda they were sw. and w., moderate in force, and over the ocean west of 65° W. they were from n., blowing with the force of a stong gale. The s. s. "Lorenzo D. Baker," W. F. Wiley, commanding, reported barometer 30.04 (763.7), falling, at about 7 a. m. (ship's time), in N. 37° 07′, W. 70° 0′, wind nne., force 8; the s. s. "British Prince," S. Nowell, commanding, at 7.47. a. m. (ship's time), in N. 39° 44′, W. 66° 33′, had barometer 29.86 (758.4), wind nnw., force 9; the s. s. "Columbia," R. T. Garvie, com-

manding, in N. 42° 3′, W. 63° 41′, barometer 29.74 (755.4), wind ne., force 9; and the s. s. "Elbe," F. Hamelmann, commanding, in N. 42° 5′, W. 61° 54′, barometer 29.72 (754.9), wind e., force 8; the s. s. "Orinoco," J. S. Garvin, commanding, in N. 34° 24′, W. 66° 40′, barometer 30.03 (762.7), wind sw., force 6, overcast; the bark "Exile," G. J. Pearce, commanding, in N. 41° 27′, W. 58° 25′, barometer 29.85 (758.2), wind se., force 8, rain.

The s. s. "Celtic," B. Gleadell, commanding, reported a whole gale on the 9th from se. to s., sw., w., nw., n., ne., n., and nw., the wind attaining its greatest force when at nnw.; the lowest reading was 29.44 (747.8), at 7 p. m., in N. 42° 15′, W. 63° 04′; at 4 p. m. on the 9th the barometer on board the s. s. "Columbia" had fallen to 29.59 (751.6), and the wind shifted from ne. to n., vessel's position being N. 42° 08′, W. 64° 48′. The s. s. "Aurania," W. H. P. Hains, commanding, reported on the 9th at noon (ship's time), in N. 44° 33′, W. 53° 55′, strong se. wind, barometer 29.85 (758.2), wind gradually increasing and veering to s. and ssw.; midnight, fresh gale, barometer 29.45 (748.0); on the 10th, at 8 a. m., in N. 42° 57′, W. 59° 47′, lowest depression of barometer, 29.29 (744.0), wind suddenly shifting to nw., from which quarter it blew a gale of force 10 for several hours. During the 10th the cyclone passed north-northeastward over Newfoundland, causing strong ne. gales in the Gulf of Saint Lawrence, and strong ssw. to sw. gales on the Banks of Newfoundland. On the 11th the cyclone was apparently to the northeast of Newfoundland; although the actual centre was probably nearer the Labrador coast, as the observations from vessels north of 46° N., and between Newfoundland and W. 40° show pressures ranging from 29.3 (744.2) to 29.6 (751.8). The winds had now shifted to w. and nw. over the ocean from W. 60° to 45°, and between N. 40° and 47°, but continued to blow with the force of 9 to 10; while those to the eastward of W. 45° and north of 47° N. were from s. to sw., strong breezes to moderate gales. On the 12th the low area was apparently central near N. 50°, and between W. 40° and 45°, but it appeared to be losing energy, as the pressure had increased to 29.7 (754.4) and the winds were slowly but gradually decreasing in force; by the following day they had fallen, generally, to a moderate or fresh breeze, except over the region east of W. 30°, where the barometric gradients were steep and the southerly winds attained the force of a gale. This low area was checked by an area of high pressures which existed to the northward and eastward, and was probably closely connected with number 7, which appeared in the same neighborhood on the 14th.

The following press reports refer to the damage caused on the Labrador coast by this cyclone:

An immense amount of damage was done on the Labrador coast by a storm on October 11th. The storm extended over the whole length of coast from Battle Harbor north to Cape Harrison. Over sixty lives are supposed to have been lost, and the destruction of fishing craft was enormous.

HALIFAX, NOVA SCOTIA, *October* 27.—A dispatch received to-day from Saint John's, Newfoundland, says: 'A great storm raged off the coast of Labrador on the 11th instant, doing immense damage among the fishing fleet gathered there. Eighty vessels were wrecked or driven ashore, and at least seventy men from the crews of the vessels lost their lives. Two thousand persons are now ashore in a destitute condition. The news created great excitement here. Steamers will be immediately dispatched to the scene of the disaster, with provisions, clothing and other comforts for the use of the castaways.'

SAINT JOHN'S, NEWFOUNDLAND, *October* 28.—The hurricane that raged on the Labrador coast was unprecedented even in that inclement region. Over seventy vessels, and probably 300 lives, were lost. The particulars so far are meagre, there being no telegraphic communication.

7.—During the 13th the atmospheric pressure over the ocean, between N. 45° and 50° and W. 30° and 40°, ranged from 29.8 (756.9) to 30.0 (762.0), and the winds were moderate or fresh; by the 14th, however, the pressure near N. 49°, W. 38°, had decreased to 29.4 (746.7) and the winds increased in force on both sides of the storm-centre, but especially in the western semi-circle, where the north winds attained the force of a strong gale. On the 15th the area of low pressure spread southward and the winds shifted to ne. and e., and continued to blow a gale, the lowest barometer reported being 29.68 (753.9), in N. 45°, W. 40°, wind ne., force 7, confused nne. and se. sea-swell. On the 16th and 17th the area of low pressure appeared to be to the westward and southward of the Azores, but the data are insufficient to definitely determine its position.

8.—This area of low pressure appeared over the Bay of Biscay on the 16th, with the pressure near the storm-centre about 29.7 (754.4), and attended by moderate gales on the French coast and over the ocean westward to the twentieth meridian. The centre of this low area appears to have pursued an abnormal course, having moved from the Bay of Biscay westward out into the ocean. On the 17th it was shown near N. 48°, W. 15°, where the barometer read 29.8 (756.9), and by the following day it had disappeared from the chart.

9.—This area appeared near the mouth of the English Channel on the 21st, the barometer at the centre of the low area falling to 29.49 (749.0); moderate sw. to w. and nw. gales prevailed over the Bay of Biscay and off the British coasts. On the 22d this area passed northeastward and beyond the range of the marine observations.

10.—This area of low pressure appeared off the southwest coast of Ireland on the 22d, with barometer about 29.5 (749.3), and accompanied by moderate w. gales near the fiftieth parallel. During the day it moved southeastward and probably joined an area of low barometer, which, on the 23d, was central over the southern part of the Bay of Biscay.

11.—This area apparently formed over the southern part of the Bay of Biscay on the 23d, and, in conjunction with that referred to above (number 10), caused strong n. gales over the ocean between W. 10° and 20°, and equally strong e. and se. gales over the British Isles and the Channel. On the 23d the s. s. "Bessel," C. J. Watson, commanding, reported barometer 29.4 (746.7), in N. 46° 54′, W. 10° 0′, wind veering to n., force 9.

12.—This area of low pressure appeared on the 23d to the southeastward of Nova Scotia; on that, and during the following day, the winds did not exceed the force of a strong breeze, nor did the pressure fall below 29.8 (756.9), but on the 25th, when the storm-centre passed to the northward of the fiftieth parallel, southwesterly gales of force 8 to 9 were reported. On the 26th this area was shown to the eastward of the twenty-fifth meridian, and on the following date it probably became merged in an area of low pressure which occupied the British Isles.

13.—This area appeared over the ocean between W. 15° and 20°, and north of the fifty-fifth parallel on the 25th; during the day the low area passed over the British Isles, with pressure near the centre about 29.35 (745.5), and attended by moderate to strong westerly and northerly gales which were felt at sea westward to the twentieth meridian.

14.—This area of low pressure was developed to the eastward of Newfoundland on the 27th, on which date the pressure over the ocean between W. 40° and 50° ranged from 29.75 (755.6) to 30.0 (762.0), and cloudy or rainy weather, with strong winds from s. to e., ne., and n. prevailed in that region. By the following day (28th) the low area had moved northeastward and was central near N. 50°, W. 38°, where the barometer now read 29.6 (751.8), and the wind still remained moderate in force. Moving east northeastward, with no material change in pressure, the low area on the 29th was shown near N. 51°, W. 25°, the winds in the western quadrants of the low area having increased to the force of a moderate to strong gale. On the 30th this low area was apparently central in Ireland, the pressure, as indicated by the marine observations near the Irish coast and in the Channel, being less than 29.6 (751.8); strong nw. gales prevailed over the ocean between the Irish coast and W. 20°, while moderate to strong w. gales were reported over the northern part of the Bay of Biscay.

The passage of low areas numbers iv and vii (described under "Areas of low pressure") along the coast of the United States was attended by strong gales at sea; in the former the gales were felt over the ocean from the coast line eastward to W. 70°, and in the latter they extended, on the 30th, as far eastward as the sixtieth meridian.

OCEAN ICE.

On chart i are shown the positions of the icebergs that have been observed in the north Atlantic during October, 1885, as obtained from reports sent to this office by shipmasters, and from other data published in the "New York Maritime Register."

No icebergs were observed south of the forty-eighth parallel, nor east of the forty-seventh meridian, during October, 1885. A few bergs were reported near the Strait of Belle Isle.

In the preceding month (September) icebergs, though few in number, were encountered as far south as the forty-fifth parallel, and eastward to about W. 46°; thus, a comparison between the two months shows that the bergs are rapidly disappearing from the route of trans-Atlantic steamers.

The following is a comparison between October, 1885, and the same month in the three preceding years:

Southern limit.			Eastern limit.		
Date.	Lat. N.	Lon. W.	Date.	Lat. N.	Lon. W.
	° ′	° ′		° ′	° ′
October, 1882*			October, 1882*		
October, 1883	46 56	46 22	October, 1883	46 56	46 22
October, 1884	near Ca	pe Race	October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12

* No icebergs were reported in October, 1882.

Icebergs were reported as follows:

3d.—S. S. "Saint Laurent," in N. 48° 32′, W. 50° 32′, passed seven miles south of a small iceberg.

14th.—S. S. "Boston City," in N. 48° 21′, W. 47° 12′, passed a small iceberg; s. s. "Foscolia," in N. 51° 55′, W. 54° 06′, passed a large iceberg, also two large bergs to the northeastward of Belle Isle.

21st.—S. S. "Caspian," in N. 52° 16′, W. 53° 19′, passed several icebergs; s. s. "Lake Champlain" passed several icebergs when within about fifty miles of Belle Isle.

26th.—S. S. "Ontario," in N. 52° 06′, W. 53° 00′, passed three large icebergs and one small berg.

31st.—S. S. "Toronto" passed two icebergs off Belle Isle.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during October, 1885, eight reports concerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian; three messages were sent from Boston.

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for October, 1885, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service.

In the Rocky Mountain and Pacific coast districts, and in northern New England, the mean temperature for the month has been above the normal, the departures being greatest in the northern slope, northern and middle plateau districts, and in portions of the northern and middle Pacific coast regions, where the mean temperature ranged from 3° to 7° below the normal. To the eastward of a line extending from southwestern New Mexico north-northeastward to Manitoba the mean temperature in all districts, except northern New England, has been below the normal, the departures being most marked in the Gulf States and in portions of the upper Mississippi and Ohio valleys, Lake region, Tennessee, and the south Atlantic States, where the monthly mean temperatures ranged from 4° to 7° below the normal.

The following are some of the most marked departures from the normal:

Above normal.		Below normal.	
	°		°
Fort Shaw, Montana	7.1	Chattanooga, Tennessee	8.1
Winnemucca, Nevada	6.7	Atlanta, Georgia	7.6
Fort Assinaboine, Montana	6.1	Fort Smith, Arkansas	7.3
Portland, Oregon	5.7	Pensacola, Florida	7.2
Helena, Montana	5.3	Palestine, Texas	6.6
Cape Mendicino, California	4.2	Charlotte, North Carolina	6.4
Sacramento, California	4.0	Columbus, Ohio	5.9
Red Bluff, California	3.9	Shreveport, Louisiana	5.5

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for October, 1885.

Districts.	Average for Oct. Signal-Service observations.		Comparison of Oct., 1885, with the average for several years.
	For several years.	For 1885.	
	°	°	°
New England	51.9	50.7	— 1.2
Middle Atlantic States	57.9	56.1	— 1.8
South Atlantic States	66.2	62.3	— 3.9
Florida Peninsula	74.5	71.2	— 3.3
Eastern Gulf States	67.3	61.1	— 6.2
Western Gulf States	68.7	63.7	— 5.0
Rio Grande Valley	74.9	71.9	— 3.0
Tennessee	61.3	56.0	— 5.3
Ohio Valley	57.1	52.9	— 4.2
Lower Lake region	52.6	49.5	— 3.1
Upper Lake region	48.0	44.6	— 3.4
Extreme Northwest	42.5	41.7	— 0.8
Upper Mississippi Valley	54.0	49.7	— 4.3
Missouri Valley	51.1	48.3	— 2.8
Northern slope	43.3	47.1	+ 3.8
Middle slope	51.9	49.6	— 2.3
Southern slope	63.1	60.8	— 2.3
Southern plateau	60 4	62.8	+ 2.4
Middle plateau	49.0	53.8	+ 4.8
Northern plateau	47.2	50.4	+ 3.2
North Pacific coast region	50.8	54.4	+ 3.6
Middle Pacific coast region	58.6	61.7	+ 3.1
South Pacific coast region	65.8	68.0	+ 2.2

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily ranges of temperature are given in the tables of miscellaneous meteorological data.

The monthly ranges were greatest in the Rocky Mountain regions, extreme northwest, and upper Missouri valley; they were least along the middle and north Pacific coasts and on the Atlantic and Gulf coasts.

The following are some of the greatest and least monthly ranges:

Greatest.		Least.	
	°		°
Poplar River, Montana	72.5	Tatoosh Island, Washington Territory	14.4
Fort Yates, Dakota	70.7	Key West, Florida	18.3
Fort Sully, Dakota	68.6	San Francisco, California	23.2
Lake View, Oregon	68.2	Fort Canby, Washington Territory	24.3
Moorhead, Minnesota	66.3	Pysht, Washington Territory	28.5
Fort McDowell, Arizona	66.0	New Orleans, Louisiana	31.3
Willcox, Arizona	66.0	Galveston, Texas	32.3
Fort Bennett, Dakota	65.8	Hatteras, North Carolina	33.2

Chart v shows the ranges of extreme temperature over the United States, as determined from observations at Signal Service stations, during a series of years. The lines show the difference between the highest temperature of summer and the lowest temperature of winter as observed during the period of observations: For example, at Boston, Massachusetts, September 7, 1881, maximum temperature, 101°.5, and January 24, 1882, minimum, —13°, giving a range of 114°.5; Chicago, Illinois, July 6, 1874, maximum, 99°, and December 24, 1872, minimum, —23°, range, 122°; Detroit, Michigan, July 23,